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USING ADMINISTRATIVE RECORDS TO STUDY MOBILITY:  
THE CASE OF THE HOUSING ASSISTANCE SUPPLY EXPERIMENT

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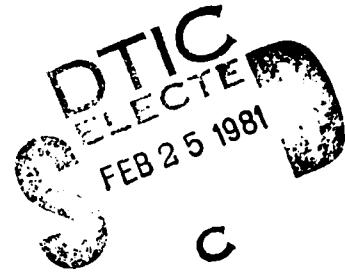
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USING ADMINISTRATIVE RECORDS TO STUDY  
RESIDENTIAL MOBILITY: THE CASE OF  
THE HOUSING ASSISTANCE  
SUPPLY EXPERIMENT



Mark David Menchik

This paper describes a statistical procedure developed to analyze the mobility experience of households who participated in an experimental test of housing allowances. Although the procedure was designed for administrative records, it is generally applicable to other longitudinal microdata that are "censored" by short periods of observation. The procedure's application here shows the major role played by eligibility requirements in the mobility of housing allowance recipients. It also highlights a potential inferential problem that is widespread in the use of administrative records. Program requirements may cause self-selection of participants according to (in this case) predisposition to move. Self-selection may therefore bias comparisons with general populations.

AUTHOR'S NOTE

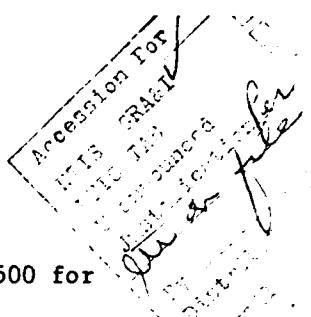
This paper draws on findings from Rand's Housing Assistance Supply Experiment, sponsored by the U.S. Department of Housing and Urban Development. I am grateful to Will Harriss and Peter Morrison; conclusions, however, are my sole responsibility. The paper will appear in *Changing the Restless Metropolis: The Policy Implications of Residential Mobility*, (W.A.V. Clark and E.G. Moore, eds.), Volume 19 in the Sage Publications series of urban affairs annual reviews.

## THE SUPPLY EXPERIMENT'S HOUSING ALLOWANCE PROGRAM

The housing assistance supply experiment tests housing allowances for low-income households. The experiment is sponsored by the U. S. Department of Housing and Urban Development (HUD). This paper examines the residential mobility of the 9,000 households participating in the supply experiment who received allowances in the first two years of program operation. Unlike the demand experiment, which samples allowance recipients, the supply experiment is open to all eligible persons in two mid-size metropolitan areas: Brown County, Wisconsin and South Bend, Indiana whose central cities are Green Bay and South Bend.<sup>1</sup>

Most other housing assistance programs subsidize the occupants of specific dwellings, either publicly or privately owned. Participants in HUD's experimental allowance program, however, choose their homes in the open market and, subject to the experiment's housing-quality constraints, may move about and rent or buy homes as they prefer without affecting their allowance entitlement.<sup>2</sup> How many, then, will take their "portable" allowances and move?

A household may enroll in the allowance program if it satisfies requirements for income, assets, family composition, and residency. If, in addition, it occupies a certified dwelling, it will receive allowance payments. The income limit is set by the assistance formula, which calculates the allowance payment as the difference between the standard cost of adequate housing for a particular household size and a fourth of adjusted gross income. The asset ceiling was originally



set high enough--\$20,000 for non-elderly households, \$32,500 for elderly ones--so that homeowners with low incomes would be eligible for assistance. Until August 1977, the family composition requirement excluded single-person households who were not elderly, disabled, or displaced by public action. The residency requirement is simply that a household be a permanent resident of Brown or St. Joseph County.

To receive allowance payments, an enrollee must occupy a certified dwelling, either the one he resides in at enrollment (the *enrollment dwelling*) or one he moves into later. A certified dwelling must meet physical standards pertaining to the unit's state of repair and presence of certain minimum facilities (e.g., a kitchen), and occupancy standards--no more than two persons per bedroom plus one room as a general living area for households of three or more persons. If the dwelling is rented, the enrollee and landlord must sign a year's lease. The housing allowance office staff tries to evaluate all enrollment dwellings, even if the enrollee is uninterested in receiving allowance payments there (perhaps because he plans to move).

#### SCOPE OF STUDY

We investigate only moves out of enrollment dwellings. (During the two-year period, recipients were enrolled an average of 11 months. In this short interval, less than 5 per cent moved more than once.) Further, only mobility within the metropolitan areas of the experimental sites is studied, since those who leave lose their eligibility for allowance payments and are thereafter not "at risk" of allowance-associated mobility.

This study examines only allowance program records. Designed primarily for administrative purposes, those records provide no direct information on residential mobility. Thus, the occurrence and timing of moves must be inferred from enrollment information, and especially from evaluation records for each participant's potential and actual dwellings. Information on the 24 per cent of enrollees who never received an allowance payment was inadequate even for inference. Enrollees who received payments have had at least one evaluation and therefore furnish the potential for inferred mobility information.

Limitation to administrative records has two consequences for this research. First, some of the recipients we study never achieved certification of their enrollment dwelling; allowance receipt meant moving into another, certified dwelling. For them, mobility was in part a program requirement, not a matter of personal choice. That fact influences our interpretation of the data. Second, allowance recipients are self-selected; i.e., they chose to participate in the program and therefore do not constitute a random sample of eligibles. Self-selection may reflect a different propensity to move for recipients than for otherwise similar non-recipients, which also argues for careful interpretation of the findings. This paper's conclusions return to the matter of self-selection.

Enrollees whose enrollment dwellings are certified may stay in them or move out. If an enrollment dwelling fails the certification evaluation, the occupant has four options: (a) have it repaired successfully, (b) move to another dwelling that becomes certified,

(c) move to an uncertifiable dwelling, or (d) stay in the uncertified enrollment dwelling. Only in the first two cases does the enrollee become a recipient and hence appear in our data. We of course have no mobility information for the last two.

If an enrollee whose enrollment dwelling was never certified later becomes a recipient, the enrollee must have moved. Such a move is more directly linked to program requirements than a move out of a certified dwelling. However, the allowance program does not force mobility from failed dwellings; the occupants can instead repair such dwellings or forgo the allowance. Although administrative records exclude mobility intentions, some enrollees doubtless plan to leave their enrollment dwellings regardless of whether they are certified. Records show, in fact, that 86 per cent of those who moved from un-certified to certified dwellings in the first two years made no attempt to repair their never-certified enrollment dwellings. (Of course some dwellings are so deficient that neither the enrollee nor his landlord--if the unit is rented--could reasonably be expected to make successful repairs.) When eventual recipients leave their never-certified enrollment dwellings, questions such as the following arise: Are those moves a large fraction of program-associated moves, or, conversely, do most movers leave certified enrollment dwellings? How quickly do eventual recipients leave never-certified dwellings?

The short period during which the recipients are at risk of mobility limits the number of movers to be studied with our data. In the first two years of program operation, recipients were enrolled an average of less than a year, and only 21 per cent moved. Distribution

by site and factors such as residential tenure and certification status further divides the number of movers. For example, only 90 recipient homeowners (with complete records) moved in Brown County, out of a total of 1,602. About half had never-certified enrollment dwellings. Of the 1,561 with certified enrollment dwellings, only 49 moved.

#### THE LENGTH-OF-STAY PROCEDURE

The data limitations here are typical of those faced by mobility analysts when working with administrative records covering short periods of time. Some few persons have moved while others have not as yet relocated. How can analysis best capture mobility information from both movers and those who are as yet stayers? Traditionally, analysts have calculated simple mobility rates, dividing the number of moves by the aggregate period households were at risk of program-associated mobility. This is an oversimplification because households with long durations of residence (i.e., periods at risk) display lower mobility rates (Speare et al., 1974).

Therefore, we developed a statistically-efficient length-of-stay procedure that analyzes how long eventual movers stay in their dwellings. It uses information that simple mobility-rate analysis does not: the exact timing of the move, as well as its occurrence. Because the length-of-stay equation resembles familiar regression equations, suspected influences on mobility can be tested as right-hand-side variables within the equation. That formulation therefore avoids decomposing the data into small subsamples.

The length-of-stay procedure can also analyze prospective mobility of households interviewed in surveys. Most surveys do not track households through successive residences. Consequently, the single or latest survey shows only that the household has not yet moved. The exact move-out date is censored information.

Even though movers' and stayers' information is different, our procedure uses both kinds of data to estimate a single equation. The characteristics of movers and other variables statistically explain the exact move-out date (their dependent variable). The period at risk of mobility is the dependent variable for stayers. The same explanatory variables explain why stayers' (prospective) move-out dates must follow our latest information about them. The supply experiment analysis shows, for example, that young recipients tend to be movers and older ones, stayers. We do so by estimating the quantitative relationship between age of household head and length of stay--actual for movers and predicted for stayers.

The length-of-stay procedure has other advantages. It can summarize mobility either as lengths of stay or as probabilities of moving within stated periods of time. The latter are very much like traditional mobility rates, but with an important exception. Because our procedure models the duration-of-residence effect, it shows how mobility rates vary with the length of past residence.

#### DURATION-OF-RESIDENCE EFFECT AND THE FORM OF THE HAZARD FUNCTION

The length-of-stay procedure requires specifying how continued residence affects the chance of moving out. That specification is

necessary in order to use both censored and uncensored data. Let  $\ell$  indicate a household's length of stay, and  $F(\ell)$  be the length-of-stay distribution function for a group of households. For any specified  $\ell$ , the value of the distribution function is the probability that group members have stays shorter than  $\ell$ . (The distribution function also depends on the characteristics of the group members, but we suppress that detail for the present.) The probability density function  $f(\ell)$  is the derivative of  $F(\ell)$ . We may loosely think of  $f(\ell)$  as the instantaneous probability of moving out exactly  $\ell$  years after move-in.

The hazard function,  $h(\ell)$ , is the conditional probability density of moving out at time  $\ell$ , i.e., given at least that long a stay. That is,

$$h(\ell) = \frac{f(\ell)}{1 - F(\ell)} ,$$

where  $f(\ell)$  is the probability density of moving out at  $\ell$ , computed on the base of all households.  $1 - F(\ell)$  is the fraction of households "surviving" to time  $\ell$ , i.e., the fraction of households moving out at  $\ell$  or later.

The solid horizontal line in Figure 1 is the simplest possible hazard function, specifying that continued stay by itself neither increases nor decreases move-out probability. The decreasing hazard functions (dashed curves) represent a simple duration-of-residence effect: The longer one stays, the less likely one is to move. The single-peaked hazard function (curves combining long and short dashes) generalize the dashed curves. Note that the hazard function is a probability density, not a simple probability, and therefore may exceed one.

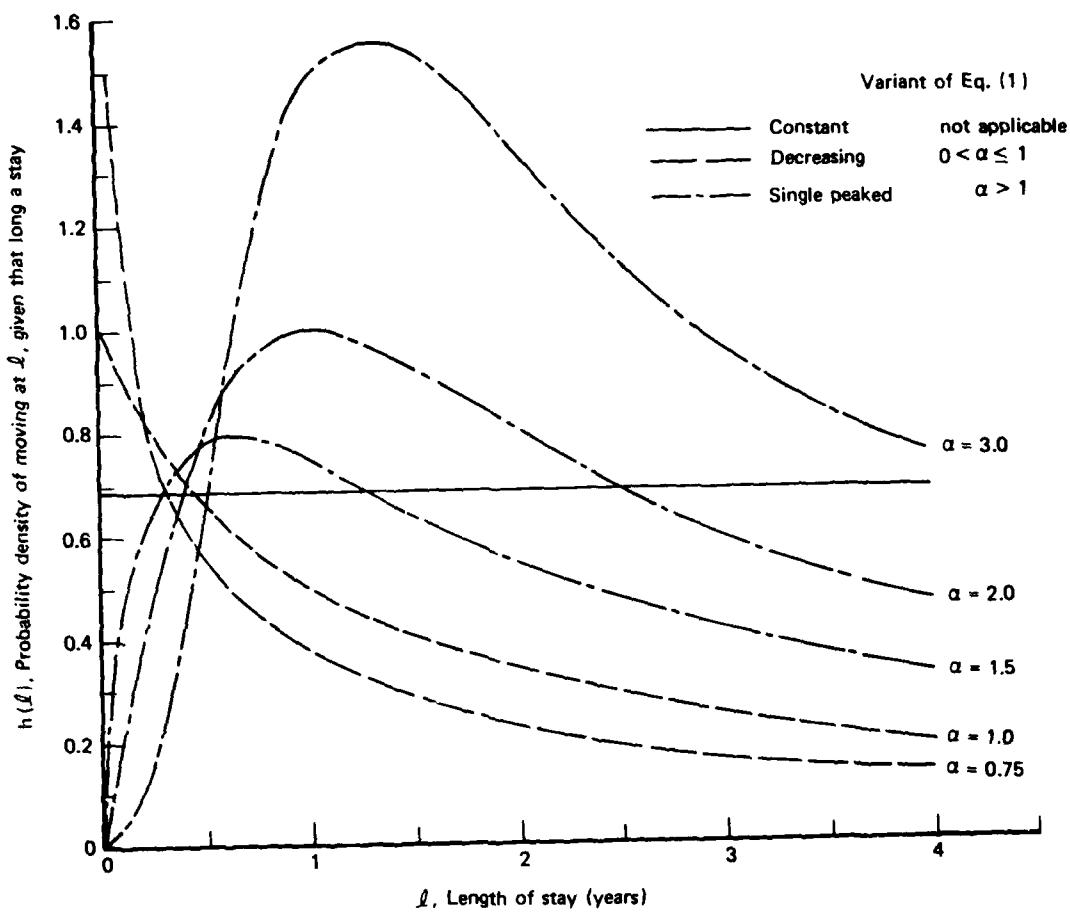


Fig. 1 — Theoretical hazard functions (median length of stay, one year)

The highest probability of moving may not actually occur at move-in. Since housing needs and characteristics of residences change, even though a household is satisfied at move-in, the equilibrium between its preferences and its residences may gradually disappear. Dissatisfaction with the residence may mount because of the arrival of another child or an increase in income, for example. It may also take time after move-in to find another residence. In the allowance

program, for example, some time passes between enrollment and evaluation and, perhaps, repairs. We can thus envision a variety of possible hazard functions consistent with particular theoretical views of what triggers the decision to move. We found that the postenrollment mobility of allowance recipients could best be phrased by "starting the clock" at enrollment, i.e., by studying postenrollment stay in the enrollment dwelling.

Two practical considerations influenced the choice of a hazard function. With censored data, the hazard function cannot be estimated directly, so even a simple function may prove to be statistically intractable. Our hazard function made estimation feasible. Because different hazard functions require different estimating procedures, we chose a general function and thereby avoided developing different estimators. Limited experimentation with other shapes of the hazard function, moreover, showed that our hazard function best fit the data.

We assumed the hazard function was

$$h(\ell) = \frac{\alpha}{\ell[1 + \exp -\alpha(\log \ell - X\beta)]}, \quad (1)$$

where  $X$  is a vector of characteristics of the households and their enrollment residences,  $\beta$  is a parameter vector, and  $\alpha$  determines the hazard function's shape. When  $\alpha$  is one or less, the hazard function is everywhere decreasing. When  $\alpha$  is greater than one, it has a peak. Figure 1 shows hazard functions which, although they all lead to a median length of stay of one year, have different values of  $\alpha$ .

The assumed hazard function defines the following relationship between length of stay, characteristics of the recipient, and characteristics of his enrollment residence:

$$\log \ell = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_m x_m + \epsilon ,$$

(2)

where  $x_1, x_2, \dots, x_m$  are the recipient characteristics, and, as a consequence of our hazard function, the error term  $\epsilon$  is a logistic random variable with mean zero and variance proportional to  $1/\alpha^2$ . This simple yet general equation parallels that of ordinary linear regression.

(11)

## THE ANALYSIS

A specially developed numerical maximum likelihood routine was used to estimate the length-of-stay equations.<sup>3</sup> The standard errors in Table 1 measure the imprecision of the equations' estimates of the median post-enrollment length of stay for different strata of allowance recipients.<sup>4</sup> The standard errors are small, both absolutely and relative to estimated length of stay, averaging at 9.8 per cent of estimated length-of-stay. The stability of the equations was confirmed by replicating them on different data from those first analyzed (Menchik, 1979, Appendix C).

Table 1

ESTIMATED POSTENROLLMENT LENGTH OF STAY FOR SELECTED GROUPINGS OF ALLOWANCE RECIPIENTS, BY CERTIFICATION STATUS OF PREENROLLMENT DWELLING

Type of Recipient	Length of Stay (years)					
	Enrollment Dwelling Certified		Enrollment Dwelling Never Certified		All Dwellings	
	Median	S.E.	Median	S.E.	Median	S.E.
Renter	3.55	.38	.13	.01	2.72	.36
Elderly	7.39	.82	.14	.02	6.77	.82
Single parent	2.00	.09	.14	.01	1.41	.08
Other	2.39	.13	.12	.01	1.83	.12
Homeowner	18.79	1.85	.17	.03	18.05	1.85
All recipients	12.07	1.69	.14	.01	10.39	1.67

NOTE: S.E. is the approximate standard error of the median in the preceding column.

Another test of the length-of-stay model is the shape of the hazard function estimated for each equation. The single-peaked shape in Figure 1 is plausible, since it shows that after enrollment the probability of moving increases to a maximum, but continued stay in the enrollment dwelling causes it to decline. That shape fit the data significantly better than the other shape consistent with the model, monotonic decrease. Limited experimentation with other equations for the hazard function and hence still different shapes--including a constant hazard function that corresponds to the assumptions of simple mobility-rate analysis--also showed that the single-peaked shape fit the data best. Our estimation of the single-peaked hazard function, and its empirical superiority to the constant hazard function, is one sign that our procedure models mobility better than does simple mobility-rate analysis.

Table 2 lists move-out probabilities for periods of one, two, and five years after enrollment.

An example will demonstrate how movement probabilities vary with post-enrollment length of stay. Table 2 shows that the probability of a single-parent renter leaving his certified dwelling is .245 the first year after enrollment. Out of 100 such households, 75.5 are thus still staying in their enrollment dwellings at the beginning of their second year of enrollment. The two-year move-out probability is .500, so 50 of the 100 households remain at the end of two years. Consequently, 25.5 households are predicted to move within the second year (.75.5 minus 50). That figure is .338 of the 75.5 households "surviving" to the beginning of the second year. The second year's mobility rate (.338) is considerably higher than that for the first year (.245). This shows the duration-of-residence effect, and also

shows the danger of simple mobility-rate analysis assuming time-invariant rates.

Table 2

ESTIMATED PERCENTAGE OF RECIPIENTS LEAVING ENROLLMENT DWELLINGS  
BY POSTENROLLMENT PERIOD

Type of Recipient	Period after Enrollment					
	1 Year		2 Years		5 Years	
	Certified Dwellings	All Dwellings	Certified Dwellings	All Dwellings	Certified Dwellings	All Dwellings
Renter	19.0	38.6	39.1	53.8	68.1	75.8
Elderly	8.2	16.0	17.3	24.4	38.3	43.6
Single parent	24.5	48.5	50.0	65.9	81.7	87.5
Other	21.1	40.4	43.4	57.3	75.4	81.4
Homeowner	2.3	6.2	5.6	9.4	16.3	19.6
All recipients	9.7	22.4	20.4	31.6	39.2	47.7

The assumptions of this analysis should be kept firmly in mind, particularly when examining figures for homeowners whose dwellings were certified--both estimated lengths of stay and move-out probabilities, which were calculated from the same length-of-stay equation. Even though both replication and experimentation with different forms of the equation for that stratum showed the figures to be stable, they are based on data in which only 2 per cent of the group was observed to move. Consequently, the estimates may be less reliable than for other groups.

Recipients whose enrollment dwellings were never certified moved very quickly, within a median of two months after enrollment. The equations for those strata contain generally different independent variables from the others.<sup>5</sup> The former include two aspects of program participa-

tion: whether or not the enrollment dwelling was repaired (repair lengthens stay) and the year of enrollment (those enrolled in the second year stay somewhat longer).

Figures 2 and 3 illustrate the differences in mobility between the various strata of allowance recipients. Eventual recipients leave never-certified dwellings so quickly that their hazard functions peak sharply (Figure 3). The probability of moving is understandably much less for those whose enrollment dwellings were certified (Figure 2). The more mobile strata in the second group have higher hazard functions that also peak earlier; e.g., the functions for single-parent renters peak at 1.45 and 1.50 years after enrollment, while the flatter ones for elderly renters and homeowners peak at 1.62 and 4.88 years.

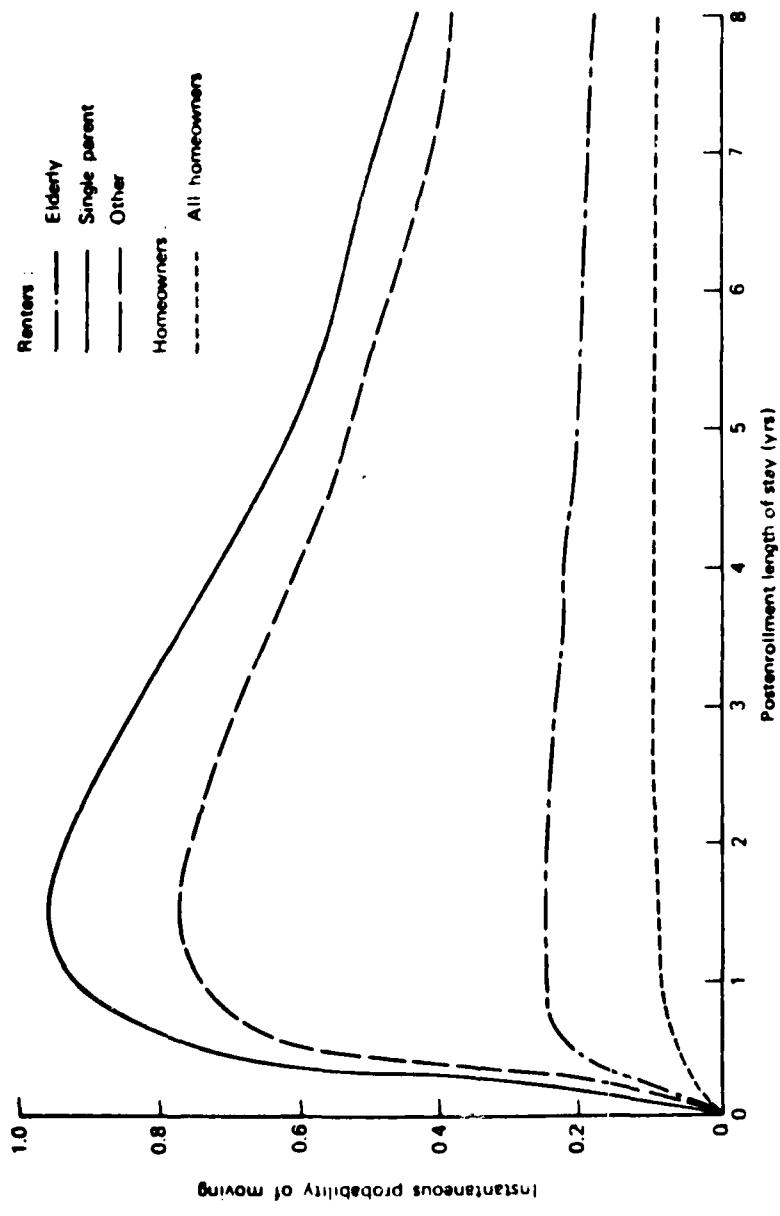
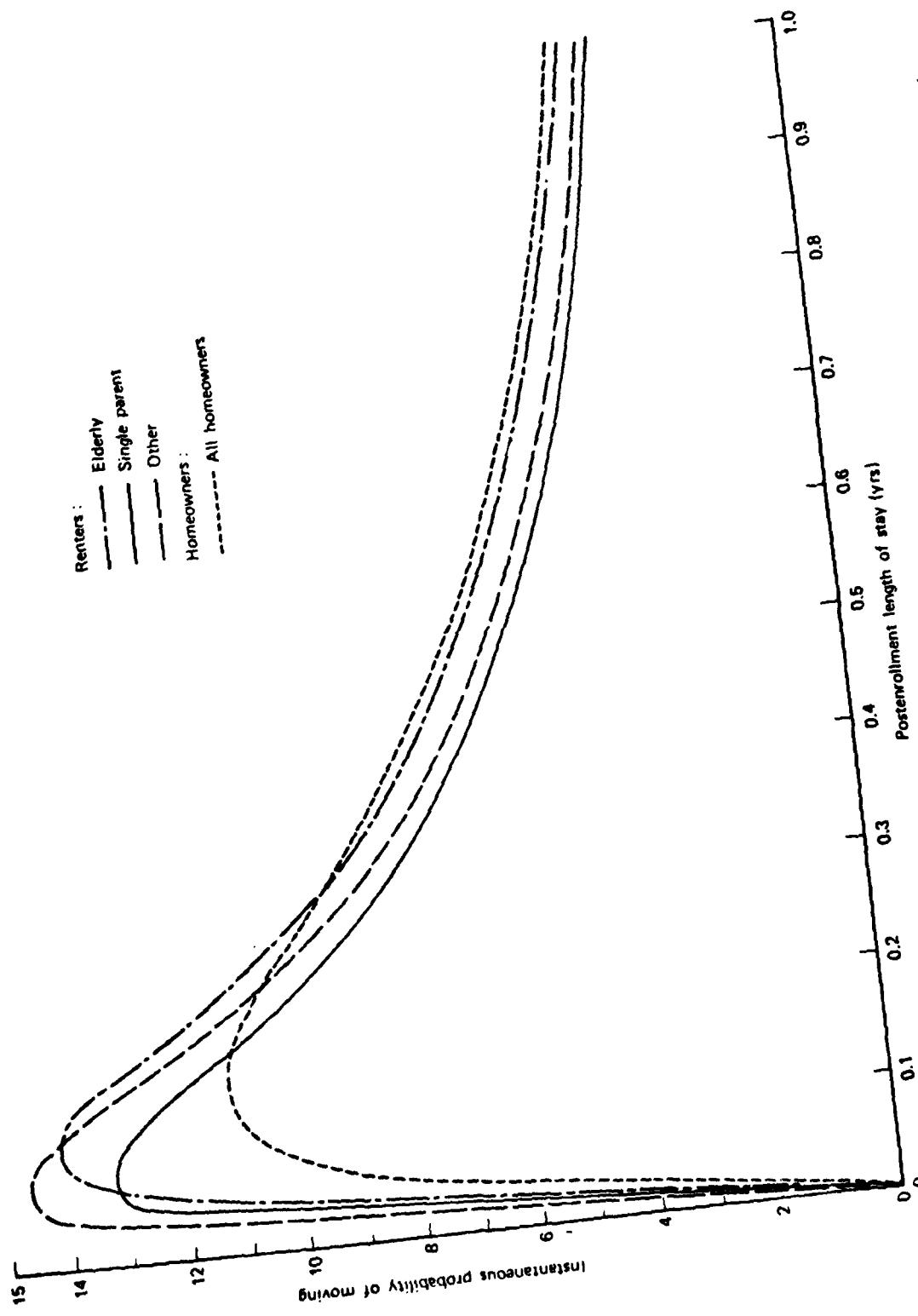


Fig. 2 — Estimated hazard functions for recipients whose enrollment dwellings were certified



## EFFECTS OF RECIPIENT AND RESIDENCE VARIABLES

Tenure and Life-Cycle Stage. After the certification status of an enrollment dwelling, tenure and occupant's life-cycle stage are the greatest influences on mobility. The latter influence, however, is limited to those whose enrollment dwelling was certified because post-enrollment length of stay does not vary appreciably among those with never-certified enrollment dwellings.

Renters whose enrollment dwelling was certified are eight times as likely as homeowners to move during the first preenrollment year; similarly, median stays for all renters are only 15 per cent of those for all homeowners (Table 1). With an estimated postenrollment stay of only two years, single-parent renters are the most mobile of all with certified enrollment dwellings. Elderly households are the least mobile of such renters, staying about 7.4 years after enrollment.

Our findings about life-cycle stage and tenure for recipients whose enrollment dwellings were certified parallel those for general populations. (For example, see Quigley and Weinberg, 1977; Speare et al., 1974.) The explanations advanced in that literature apply here, too.

Unlike renting, homeownership represents a large financial commitment, the more so because of the large transaction costs attendant on buying and selling. Homeowners are therefore more likely than renters to choose a residence that suits both their current needs and those of the foreseeable future. Homeowners who expect to stay in their new residence a long time may "put down roots" by modifying the house and grounds to their liking, establishing ties with their neighbors and

local organizations, and so on. And even when their residence no longer suits them, the difficulty and expense of selling the home may impede moving.

A household's life-cycle stage influences its mobility in several ways. In general, a household moves when its residence no longer adequately satisfies its preferences (including financial capabilities) and another one satisfies them better. Households headed by young single or married persons change rapidly. Individuals marry, incomes alter, children are born and reach school age. A recently married couple may want a better home, particularly if the household now has two incomes. Similarly, new parents need more space for their children. As adults age, however, household change occurs less frequently.

Poor, single-parent families tend to live under frequently abruptly changing circumstances, that compel frequent moves. Many such families result from the father's departure or death; their very formation therefore accompanies the loss of a wage-earner, which drastically lowers their ability to pay for housing. If the mother's childcare responsibilities prevent her from working full time, income is frequently an uncertain mixture of public subsidy, low-paying part-time jobs, and perhaps child support payments or gifts from relatives. Consequently, it is not surprising that single-parent renter households are the most mobile of all allowance recipients.

Age of Household Head. Because homeowners were not disaggregated by life-cycle stage, their equations included instead the age of the household head, in logarithmic form. Homeowners whose enrollment units were certified display an age elasticity of 0.94, with a standard error

of .25.

Site and Race. In spite of the fact that vacancy rates were decidedly lower in Brown than in St. Joseph County, a recipient's site was not significantly associated with his mobility. The mobility influence of race disappeared when other characteristics were taken into account. The results of tests on other variables appear in Menchik (1979, pp. 31-51).

#### EFFECTS OF PROGRAM-PARTICIPATION VARIABLES

We have seen that tenure and life-cycle stage exert strong, consistent influences on the postenrollment stay of recipients with certified enrollment dwellings, but that no demographic variable influences how long recipients stay in never-certified units. Program-related variables display an opposite pattern: year of enrollment and whether repairs were done in the enrollment unit slightly affect the length-of-stay for those whose enrollment dwellings that were not certified, but have no effect on recipients with certified units.

Enrollment Dwelling Repair. Table 3 shows that most renters who repair a never-certified enrollment dwelling stay in it two or three times longer than otherwise, but still leave within a few months of enrollment. That effect was found for renters in all life-cycle stages, though not for homeowners. But for certified dwellings, earlier length-of-stay equations showed that repair was a consistently nonsignificant influence on length-of-stay.

Table 3

## EFFECT OF REPAIR ON STAY IN NEVER-CERTIFIED ENROLLMENT DWELLINGS

Type of Recipient	Length of Stay (years)					
	Dwelling Repaired		Dwelling Never Repaired		All Never-Certified Dwellings	
	Median	S.E.	Median	S.E.	Median	S.E.
Renter	.26	.06	.12	.01	.13	.01
Elderly	.34	.17	.12	.02	.14	.02
Single parent	.28	.05	.13	.01	.14	.01
Other	.21	.07	.12	.01	.12	.01
Homeowner	.14	.04	.20	.03	.17	.03
All recipients	.24	.06	.13	.01	.14	.01

The variable role of repairs in mobility has no simple explanation. Perhaps those who unsuccessfully repair their failed units are more committed to their homes than others who do not attempt repair. The time taken for the repair itself may slightly lengthen their stay (although the time for repairs does not lengthen stays in eventually certified units).

Year of Enrollment. We sought evidence on whether recipients who enrolled toward the beginning of program operation had different mobility characteristics from those who enrolled later. No such differences were found for recipients whose enrollment dwellings were certified. A slight (but significant) difference appeared between certain renters who enrolled in the first or second years of program operation. Table 4 shows that single-parent and other never-certified

renters who enrolled in the second year stayed about half again as long as those who enrolled in the first year. Year of enrollment had the same influence (or lack of influence) on length of stay when the sites were analyzed separately, and when time of enrollment was defined by half-year. Perhaps self-selection was operating. Those who enrolled in the first year may have needed (or wanted) allowances more strongly than those who enrolled later, and therefore acted quickly to satisfy program requirements.

Table 4

POSTENROLLMENT STAY BY YEAR ENROLLED: RECIPIENTS WITH NEVER-CERTIFIED ENROLLMENT DWELLINGS

Type of Recipient	Length of Stay (years) if Enrolled in:					
	First Year		Second Year		Both Years	
	Median	S.E.	Median	S.E.	Median	S.E.
Renter	.10	.01	.15	.01	.13	.01
Elderly	(a)	--	(a)	--	.14	.02
Single parent	.10	.01	.16	.01	.14	.01
Other	.09	.01	.14	.01	.12	.01
Homeowner	(a)	--	(a)	--	.17	.03
All recipients	.11	.01	.16	.01	.14	.01

<sup>a</sup>Variable was nonsignificant and so length of stay was not calculated for each year.

Whether the enrollment dwelling was certified at first inspection did not explain subsequent mobility as well as did eventual certification status. Moreover, once information on the final outcome of certification and the presence of repairs was included in the analysis,

the initial certification added no new information and therefore was nonsignificant. The same result occurred for a related variable: the number of housing deficiencies (either zero or a positive integer) found in the enrollment dwelling's first inspection. That variable is strongly associated both with whether repairs were made and with the eventual outcome of certification. It thus provided no new information.

It is now clear why we stratified recipients according to eventual rather than initial certification outcome. Not only is eventual outcome more strongly related to mobility, but stratification by initial outcome would combine two groups that, although each failed initial certification, had very different later mobility: those whose enrollment dwellings were never certified, and those who successfully repaired them. In fact, the latter group's mobility is indistinguishable from those whose enrollment dwellings were certified upon first inspection.

Notice, too, that because eventual recipients whose enrollment dwellings were never certified moved so quickly, their hazard functions differ greatly from those of other recipients. Estimation would therefore require stratification by final outcome even if the data were also stratified by initial outcome. Explaining mobility by both initial and final outcome would therefore add no more to our results than would stratification by final outcome alone.

#### RELATION BETWEEN POSTENROLLMENT AND PREENROLLMENT STAY

One reason that different life-cycle and tenure groups have different postenrollment lengths of stay is their different preenrollment stays. On the one hand, recipients who occupy their enrollment dwellings a long time before enrolling tend to stay a long time afterward;

e.g., elderly renters occupy certified enrollment units a median of 4 years before and 7 years after enrolling. On the other hand, single-parent renters stay less than a year before enrolling and only two years thereafter.

Postenrollment length of stay thus increases with preenrollment stay for certified dwellings. The relation holds both across and within the four recipient strata, although the relation is, of course, weaker within groups. Our findings agree with the duration-of-residence effect observed in general populations. Three explanations may account for these facts in the recipient population. First, those who stay in their home a long time before enrollment may do so because they are intrinsically less mobile than others; if so, they are also less likely to leave after enrollment. Second, a long stay may strengthen ties to home and neighborhood. Third, since longstanding renters enjoy a rent discount, which they lose on leaving, they may resist moving.

#### CONCLUSIONS

#### LENGTH-OF-STAY PROCEDURE

The new procedure efficiently analyzes heterogeneous mobility histories censored by a short period of observation. Allowance recipients' periods of enrollment (and thus period at risk of program-associated mobility) varied greatly, from mere days to two years, but averaged less than a year. During this period, only 8 per cent of recipients moved whose enrollment dwellings were certified for allowance receipt.

Half of all recipients were homeowners with certified enrollment dwellings; of these, less than two per cent moved. On the other hand, virtually all eventual recipients whose enrollment dwellings were never certified moved within a few months. Consequently, the data were disaggregated into 8 strata according to the prime mobility determinants. (Other mobility influences appeared as right-hand-side variables.) Even after disaggregation, mobility was accurately and reliably estimated. Standard errors averaged less than ten per cent of estimated length of stay and the length-of-stay equations were successfully replicated on an independent data set.

Many of the estimated hazard functions are importantly nonhorizontal, showing mobility as strongly influenced by duration of residence after enrollment. This duration-of-residence effect causes analysis based on simple mobility rates to be inaccurate. In all cases, hazard functions belonged to the same family of single-peaked curves where the propensity to move first rises with continued residence and later declines.

#### INFLUENCES ON RECIPIENTS' MOBILITY

The primary determinant of an allowance recipient's mobility is whether his enrollment unit was ever certified. In the first two years of the program in both sites, only 14 per cent of all recipients' enrollment dwellings failed certification. However, since recipients with never-certified enrollment dwellings must move to a certified dwelling to receive an allowance, that group accounts for fully 68 per cent of all the recipients who left their enrollment dwellings. Recipients with certified dwellings are estimated to stay in them a median of 12 years after enrollment; those with uncertified enrollment dwellings stay in

them only 0.14 years after enrollment, i.e., less than two months.

For recipients whose enrollment dwellings are certified, mobility is influenced largely by personal characteristics and tenure. Homeowners stay a median of 19 years, renters less than four years. Life-cycle stage also influences mobility. Single-parent families who are renters are the most mobile, staying about two years in their enrollment units, whereas elderly renters stay about 7 years after enrollment.

The few influences acting on recipients' brief stay in never-certified enrollment units suggests that program characteristics play the important role, whereas personal or residential characteristics influence both the mobility of the general population and the mobility of recipients with certified enrollment units. Tenure and life-cycle stage do not influence the point at which recipients leave never-certified enrollment dwellings. On the other hand, stay is roughly doubled for renters who unsuccessfully attempt repairs, though it is still less than four months. Repairs to an eventually certified unit did not affect the resident's mobility. Some renters stayed slightly longer in never-certified units if they enrolled in the second year of program operation. No such association holds for those in certified enrollment units.

#### SELF-SELECTION

If recipients self-select according to predisposition to move, the measured mobility of recipients will be influenced by that predisposition, not solely by program requirements or observable characteristics of the recipients or their housing. Two examples illustrate how self-

selection might operate.

First, some eligible persons' homes may not be certifiable even with a reasonable amount of repair. Knowing that they must move to receive allowance payments, those who are strongly attached to their homes may never apply. If so, self-selection would screen from the population studied those who are disinclined to move. By implication, eventual recipients whose enrollment dwellings are not certifiable are those who remain, i.e., persons relatively less reluctant to move. They may enroll fully expecting to move--which could explain the short stays of recipients in never-certified enrollment dwellings. (On the other hand, those households may simply want an allowance strongly enough to move quickly if their enrollment dwelling is not certified.)

Second, another self-selection process may operate. If a household lives in a residence of standard quality and wants to stay, it may apply for an allowance in hopes of getting help with housing expenses. Although that possibly may explain the much longer stays of recipients in certified enrollment units, allowance payments may actually have no effect on their mobility decision; or allowances may simply enable them to stay longer than otherwise.

Assessing true causal influences of enrollment unit certification on mobility requires mobility data about enrollees who never receive payments, as well as about eligible persons who never apply. Mobility histories before enrollment would also be helpful, since preenrollment stays in the enrollment dwelling may signal attachment to that unit. Even better would be data on the length of stay in the dwelling occupied before the enrollment unit, which can indicate how mobile the household really is.

Such data could be supplied by the supply experiment's surveys, which interview a sample of households, some of whom participate in the allowance program.

Fortunately, the data analyzed here allow us to assess the first example of the self-selection hypothesis: that those whose enrollment dwellings were never certified did not stay in them long before enrolling, were unattached to them, and chose not to have the units certified. Table 5 shows that (controlling for tenure and life-cycle stage) those whose enrollment dwellings were never certified usually stayed in them about as long before enrollment as those whose enrollment dwellings were certified.<sup>6</sup> By that measure at least, failure to certify, not prior tendency to move, in itself causes eventual recipients to leave never-certified dwellings so quickly.

Table 5

PREENROLLMENT STAY IN CERTIFIED AND NEVER-CERTIFIED  
ENROLLMENT DWELLINGS

	Median Preenrollment Stay (years)		
	Enrollment Dwelling Certified	Enrollment Dwelling Never Certified	All Dwellings
Renter	1.04	.77	.96
Elderly	3.72	4.38	3.83
Single Parent	.65	.67	.66
Other	.80	.60	.76
Homeowner	10.97	8.06	10.89
All recipients	4.00	.99	3.18

NOTES

1. Details of the two experimental sites and of the data appear in Menchik (1979), which describes the analysis in more detail.
2. Unlike the demand experiment, homeowners may participate in the supply experiment.
3. Pages 28-30 of Menchik (1979) sketch the estimating routine.
4. The following conventions apply to the length-of-stay estimates:
  - (a) The household is assumed to continue to be at risk of program-associated mobility, that is, to continue to be enrolled; (b) mobility determinants other than those appearing explicitly in a table are set equal to the mean for that particular group of allowance recipients.
5. For estimation, the data were divided into 8 strata corresponding to the curves in Figures 2 and 3.
6. There is a slight tendency for never-certified "other" renters and homeowners to stay a shorter time before enrollment than their counterparts in certified dwellings. But that disparity cannot explain the enormous difference in postenrollment length of stay according to certification status of the enrollment dwelling.

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